



**University of  
Zurich**<sup>UZH</sup>

**Zurich Open Repository and  
Archive**

University of Zurich  
University Library  
Strickhofstrasse 39  
CH-8057 Zurich  
[www.zora.uzh.ch](http://www.zora.uzh.ch)

---

Year: 2021

---

## **Well-Being and Loneliness in Swiss Older Adults during the COVID-19 Pandemic: The Role of Social Relationships**

Macdonald, Birthe ; Hülür, Gizem

**Abstract:** Background and objectives: The current COVID-19 pandemic and social distancing measures are an extreme stressor that might result in negative emotional experiences and feelings of loneliness. However, it is possible that social relationships might have a protective effect. In the present study, we examine how the COVID-19 pandemic affected older adults' well-being and loneliness, and the role of structural and functional characteristics of social relationships. Research design and methods: We use data from 99 older adults in Switzerland who participated (a) in a three-week micro-longitudinal study on social relationships and well-being in 2019 and (b) in a weekly online survey during four weeks of the COVID-19 lockdown. Results: Our findings show that the global pandemic had substantial adverse effects on older adults' emotional well-being and loneliness. In addition, aspects of social relationships were related to loneliness both before and during the pandemic. Only one functional feature of social relationships (satisfaction with communication during the pandemic) buffered adverse effects of the major stressful event. Discussion and implications: Although the social distancing measures during COVID-19 presented a major stressor for older adults' well-being and loneliness, being able to maintain social communication to a satisfactory level during that time reduced this effect. Therefore, enabling older adults to stay in touch with their social circle based on their personal preferences might reduce the impact that any future lockdown might have on their well-being.

DOI: <https://doi.org/10.1093/geront/gnaa194>

Posted at the Zurich Open Repository and Archive, University of Zurich

ZORA URL: <https://doi.org/10.5167/uzh-193622>

Journal Article

Accepted Version



The following work is licensed under a Creative Commons: Attribution 4.0 International (CC BY 4.0) License.

Originally published at:

Macdonald, Birthe; Hülür, Gizem (2021). Well-Being and Loneliness in Swiss Older Adults during the COVID-19 Pandemic: The Role of Social Relationships. *The Gerontologist*, 61(2):240-250.

DOI: <https://doi.org/10.1093/geront/gnaa194>

# Well-Being and Loneliness in Swiss Older Adults during the COVID-19 Pandemic: The Role of Social Relationships

Birthe Macdonald, PhD<sup>1,\*</sup> & Gizem Hülür, PhD<sup>2</sup>

<sup>1</sup> URPP “Dynamics of Healthy Aging”, University of Zurich, Switzerland, Zurich,  
Switzerland

<sup>2</sup> School of Aging Studies, College of Behavioral and Community Sciences, University  
of South Florida, Tampa, Florida, USA

\*Address correspondence to: Birthe Macdonald, PhD, URPP “Dynamics of Healthy Aging”,  
Andreasstrasse 15, 8050 Zurich, Switzerland. E-mail: [birthe.macdonald@uzh.ch](mailto:birthe.macdonald@uzh.ch)

## Funding

This research was supported by the Swiss National Science Foundation, grant number  
10DL1C\_183146.

## Conflict of Interest

None to declare.

© The Author(s) 2020. Published by Oxford University Press on behalf of The Gerontological Society of America.

This is an Open Access article distributed under the terms of the Creative Commons Attribution Non-Commercial License (<http://creativecommons.org/licenses/by-nc/4.0/>), which permits non-commercial re-use, distribution, and reproduction in any medium, provided the original work is properly cited. For commercial re-use, please contact [journals.permissions@oup.com](mailto:journals.permissions@oup.com)

## Abstract

*Background and Objectives:* The current COVID-19 pandemic and social distancing measures are an extreme stressor that might result in negative emotional experiences and feelings of loneliness. However, it is possible that social relationships might have a protective effect. In the present study, we examine how the COVID-19 pandemic affected older adults' well-being and loneliness, and the role of structural and functional characteristics of social relationships.

*Research Design and Methods:* We use data from 99 older adults in Switzerland who participated (a) in a three-week micro-longitudinal study on social relationships and well-being in 2019 and (b) in a weekly online survey during four weeks of the COVID-19 lockdown.

*Results:* Our findings show that the global pandemic had substantial adverse effects on older adults' emotional well-being and loneliness. In addition, aspects of social relationships were related to loneliness both before and during the pandemic. Only one functional feature of social relationships (satisfaction with communication during the pandemic) buffered adverse effects of the major stressful event.

*Discussion and Implications:* Although the social distancing measures during COVID-19 presented a major stressor for older adults' well-being and loneliness, being able to maintain social communication to a satisfactory level during that time reduced this effect. Therefore, enabling older adults to stay in touch with their social circle based on their personal preferences might reduce the impact that any future lockdown might have on their well-being.

**Keywords:** COVID-19, Social distancing, Stress buffering, Social interaction, Longitudinal, Positive affect, Negative affect

## Background and Objectives

In March 2020, the WHO declared Coronavirus Disease-2019 (COVID-19) a world-wide pandemic (WHO, 2020). While countries world-wide went into lockdown to flatten the curve of new infections and prevent medical systems from collapsing, adults over 65 years of age were considered as particularly vulnerable to developing serious health complications from COVID-19 and advised to adhere to strict social distancing measures (CDC, 2020; Jordan et al., 2020). Measures to reduce infection risks for the general population typically included recommendations to stay home and experts warned of mental health risks associated with the pandemic and with the adoption social distancing measures (Armitage & Nellums, 2020; Jawaid, 2020). These include anxiety related to infection and illness, the economic situation, and social isolation due to precautionary measures. Research in lifespan samples shows that the pandemic was associated with changes in mental health (González-Sanguino et al., 2020) and well-being (Zacher & Rudolph, 2020). A Swedish cohort study of older adults showed that decline in well-being during the pandemic was not universal but associated with higher rates of worry about health and financial issues (Kivi et al., 2020). Conversely, higher rates of worry about societal issues as well as higher adherence to social distancing measures were associated with higher well-being (Kivi et al., 2020). Older adults in a nationwide lifespan sample of adults in the United States showed an increase in loneliness from January to March 2020 during the acute phase of the COVID-19 pandemic (Luchetti et al., 2020). Levels of loneliness remained stable from March to April 2020. Being younger, negative self-perceptions of aging, lower levels of personal and familial resources, and perceiving oneself as a burden were associated with increased levels of self-reported loneliness in an adult lifespan sample from Spain (Losada-Baltar et al., 2020).

Because older adults were asked to adhere to strict social distancing measures to protect themselves from COVID-19, they might have been at particular risk of a decline in their well-

being. The goal of the present study is to understand the effect of the pandemic on older adults' emotional well-being and loneliness and potential buffering effects of structural and functional components of social relationships.

According to the buffering hypothesis of social support, social relationships can buffer negative impacts of severe stressors (Cohen & Wills, 1985). Research on social relationships usually differentiates between structural and functional features of social relationships (August & Rook, 2013; Valtorta et al., 2016). Structural features are related to quantitative aspects of social relationships, such as the size of an individual's social network, type of social network partners (e.g., friend, family member), or frequency of social interaction. Functional features are related to qualitative aspects, including the experience of social support, or satisfaction with one's social relationships.

Several structural and functional relationships have been linked to subjective well-being and feelings of loneliness across the lifespan, including old age. Although living alone does not necessarily indicate being isolated, people living in single-person households report higher levels of loneliness and social isolation than others (Victor et al., 2000). Having a large social network (Bruine de Bruin et al., 2020; Chan & Lee, 2006) and more frequent social interaction (Amati et al., 2018; Appau et al., 2019) are both related to higher levels of well-being. With regard to functional features of social relationships, research has widely documented associations between social support and psychosocial well-being (Chen & Feeley, 2014; Siedlecki et al., 2014). A particularly relevant aspect of social support is perceived social support, that is, support that is perceived as available from one's social network when needed.

Research has also examined whether social relationships can buffer adverse effects of stress on well-being. With respect to social support, stress-buffering effects were often observed for perceived availability of support (Hartley & Coffee, 2019; Luszczynska &

Cieslak, 2005; Wethington & Kessler, 1986), whereas received support can have an undermining effect on the individual receiving support (Bolger et al., 2000). Other functional features of social relationships have also been found to have stress-buffering effects, including companionship (Rook, 1987) and warmth (Lippold et al., 2016).

### **The current study**

In the current study, we examine the effect of the nationwide lockdown on subjective well-being and feelings of loneliness in older adults in Switzerland using data that were obtained before and during the pandemic. The COVID-19 lockdown in Switzerland included the prohibition of gatherings of more than 5 people, the closing of all bars, restaurants, and non-essential stores, as well as sports and entertainment venues such as swimming pools, gyms, cinemas, and theatres. Individuals were advised to remain at a 2-meter distance and not to visit other households. Older adults in particular were advised to stay home, not receive visitors, and to organize any essential shopping to be delivered if possible. We assessed positive and negative affect, as well as loneliness daily for 21 days during 2019, and weekly for 4 weeks during the COVID-19 lockdown in 2020. Based on theoretical perspectives and empirical findings, positive and negative affect are considered independently, as they provide unique information about individuals' affective states (Diener & Iran-Nejad, 1986; Zevon & Tellegen, 1982).

We hypothesize that positive affect will be lower, and negative affect as well as loneliness will be higher during the first four weeks of lockdown. In accordance with the buffering hypothesis and based on prior research, we expect structural and functional aspects of social relationships to show stress-buffering effects.

## Research Design and Method

### Participants and Procedure

We use data from a study on well-being, loneliness, and social relationships with 120 older adults in Switzerland conducted in 2019 and a follow-up survey conducted shortly after COVID-19 precautionary social distancing measures were introduced. The complete protocol for the 2019 study and descriptive information are provided in previous publications (Hülür & Macdonald, 2020; Macdonald & Hülür, 2020). Details relevant to the current study are given below.

The data collection before the pandemic took place between April and November 2019. One of the inclusion criteria was using digital devices to communicate with others. Participants were asked to complete brief questionnaires about their daily social interactions for 21 days, including information about the interaction (e.g., interaction partner, communication medium, duration) as well as their perception of it (e.g., closeness to interaction partner, positive and negative affect). Each day, participants also reported their well-being in an evening questionnaire. The study also included assessments taken at baseline, including information on socio-demographics and health. Other inclusion criteria were being at least 65+ years old, having sufficient vision and hearing, and being fluent in German.

Participants were recruited via adverts in local and national newspapers, and through a database of participants hosted at the University of Zurich. Participation was incentivized with 150 Swiss Francs. In March 2020, shortly after social distancing measures were put into place in Switzerland, the same participants were contacted again and asked whether they would be willing to participate in a weekly questionnaire on their subjective well-being and communication during the pandemic. Data collection was changed from daily to weekly to

ensure a high participation rate and facilitate long-term data collection, for which daily data collection might not be suitable. Participants could enter a raffle to win 50 Swiss Francs as a voucher or to donate to a charity of their choice. In the present study, we consider data obtained during four weeks between March 27, 2020 and April 24, 2020. Out of 120 participants in the earlier study, 99 participants (83%) completed the COVID-19 survey at least once during the four-week period analyzed in the present study. Our study protocol was reviewed by the Ethics Committee of the Faculty of Arts and Social Sciences at the University of Zurich.

## Measures

**Outcomes.** To assess positive (PA) and negative affect (NA) as well as loneliness, participants were presented with a selection of adjectives (positive: “strong”, “determined”, “happy”, “relaxed”, negative: “distressed”, “upset”, “irritable”, “unhappy”, loneliness: “lonely”, “belonging” [reverse coded], “accepted” [reverse coded], “isolated”). Participants indicated on a slider scale ranging from “not at all” – “very much” (0 - 100) how they felt during the last day (in 2019) or week (during COVID-19 lockdown). Participants responded to these items every evening during the 2019 data collection (up to 21 observations per participant), and weekly during the COVID-19 lockdown (up to 4 observations per participant).

**Predictors.** Structural aspects of social relationship included living alone, social network size, and frequency of social interaction. *Living alone (assessed in 2019)* was a binary variable (1 = yes; 0 = no). *Social network size* was assessed in 2019 using the Convoy Model (Antonucci, 1986; Antonucci et al., 2014) and defined as the total number of individuals participants included in the convoy diagram. *Frequency of social interaction in 2019* was defined as the total number of short questionnaires participants completed on a smartphone after every social interaction during the 21-day data collection period. During the COVID-19



lockdown, participants responded to the items “How frequently did you interact with other personally/by phone/by videochat/by text message?” with the response options “never” (1), “once” (2), “2-3 times” (3), “daily” (4), “several times per day” (5). *Frequency of social interaction during COVID-19 lockdown* was defined as the response indicating the highest frequency of interaction across interaction modalities. Data were averaged for each participant across available measurement occasions (up to 4 weekly measurement occasions). Functional aspects of social relationships included availability of perceived support and satisfaction with communication. *Social support* was assessed with the perceived available support scale of the Berlin Social Support Scales (BSSS, (Schulz & Schwarzer, 2003). This scale consists of 8 items (e.g. “Whenever I am not feeling well, other people show me that they are fond of me”; “I know some people upon whom I can always rely”) that are rated on a four-point scale (strongly disagree (1), somewhat disagree (2), somewhat agree (3) and strongly agree (4)). Participants completed this scale during data collection in 2019. *Satisfaction with social interactions* was assessed every evening in 2019, and weekly during the COVID-19 lockdown by asking how satisfied they were with the frequency of their social interactions. Participants responded on a 1-5 scale with regard to the previous day in 2019 and on a 0-100 scale with regard to the previous week during the COVID-19 pandemic. These data were averaged for each participant across available measurement occasions (up to 21 days in 2019, and up to 4 weekly measurement occasions during the COVID-19 pandemic).

**Time metric.** *Time* was a binary variable with the 2019 assessment considered as an individual pre-pandemic baseline (coded 0) and observations during the pandemic coded as 1.

**Control variables.** Control variables were collected in 2019 and included participants’ age in years, gender (0 = women, 1 = men), and number of physician-diagnosed health conditions (possible range: 0-23, list provided in Supplemental Material section A).

## Data analysis

To assess the sample characteristics as well as associations between variables, descriptive statistics and correlations between variables were calculated. A multilevel model was applied to up to 25 occasions of data per participant (up to 21 points of data in 2019, up to 4 points of data after the implementation of COVID-19 lockdown) to examine how positive and negative affect and loneliness changed during the time that coincided with the implementation of the COVID-19 lockdown. The model was specified as

$$\text{Outcome}_{ti} = \beta_{0i} + \beta_{1i}(\text{time}_{ti}) + e_{ti} \quad (1),$$

where  $\text{Outcome}_{ti}$ , person  $i$ 's score for positive affect, negative affect, or loneliness at occasion  $t$ , is a function of an individual specific intercept parameter,  $\beta_{0i}$ ; an individual-specific parameter,  $\beta_{1i}$ , capturing difference between observations before and during the pandemic (time coded 0 for observations in 2019 and 1 for observations obtained after the implementation of the COVID-19 lockdown); and residual error,  $e_{ti}$ .

Individual-specific parameters were modeled as

$$\beta_{0i} = \gamma_{00} + u_{0i}; \quad (2)$$

$$\beta_{1i} = \gamma_{10} + u_{1i}; \quad (3)$$

where the  $\gamma$  parameters represent sample-level averages and the  $u$  parameters represent individual-specific deviations from these sample-level averages.

In a second step, we examined effects of each predictor on levels of outcome variables as well as moderating effects on change associated with the time period coinciding with the COVID-19 lockdown. Effects were modeled as

$$\beta_{0i} = \gamma_{00} + \gamma_{01}(\text{predictor}_i) + u_{0i}; \quad (4)$$

$$\beta_{1i} = \gamma_{10} + \gamma_{11}(\text{predictor}_i) + u_{1i}; \quad (5)$$

where the  $\gamma_{01}$  parameter indicates the main effect of a predictor on outcome variables (positive affect, negative affect, and loneliness) and the  $\gamma_{11}$  parameter indicates moderating effects of this predictor for change associated with the time period coinciding with the COVID-19 lockdown. In a third step, all variables were included in a single model to examine their independent effects. To avoid multicollinearity, satisfaction with communication before and during the COVID-19 pandemic were not included in the same model. To reduce model complexity, only control variables showing significant effects were included in this next step. Predictor and control variables were centered at the sample mean to facilitate interpretation. Pseudo  $R^2$  was calculated as percent reduction in residual error relative to a model that includes fixed and random effects of the intercept only. Models were estimated in R using the nlme package (Pinheiro et al., 2020). Incomplete data were treated as missing at random (Little & Rubin, 1987).

## Results

99 participants were included in the study ( $M_{age} = 71$  years,  $SD = 5$ ,  $range = 65$  to  $94$  years, 62% men). Descriptive statistics and correlations for the current sample are presented in Table 1. On average, participants completed 18.75 ( $SD = 2.95$ ) out of 21 possible questionnaires during the 2019 data collection, and 3.75 ( $SD = 0.68$ ) out of 4 possible questionnaires during the 2020 data collection. The number of completed questionnaires in 2019 correlated with social network size ( $r = .20$ ,  $p = .03$ ), and 2019 interaction frequency ( $r = .30$ ,  $p = .01$ ). The number of completed questionnaires during the COVID-19 data collection was not associated with any study variable.

Table 2 shows results from unconditional multilevel models examining change in positive affect, negative affect, and loneliness associated with the time period coinciding with

the COVID-19 lockdown. The results reported in this table include fixed and random effects from multilevel models described in the data analysis section (Equations 1-3). On average, participants rated their positive affect, negative affect, and loneliness at 70, 17, 20 points before the pandemic (see  $\gamma_{00}$  parameters), respectively, on a scale from 0 to 100. There were substantial individual differences around these estimates, as indicated by the standard deviations of these parameters (see  $\sigma_{u0}$  parameters). In the time period coinciding with the COVID-19 lockdown, positive affect declined by 5 points on average, negative affect increased by 15 points on average, and loneliness increased by 9 points on average (see  $\gamma_{10}$  parameters). Using the standard deviation of the intercept parameter ( $\sigma_{u0}$ ), the average decline in positive affect amounted to 0.44 SD units and the average increase in negative affect and loneliness amounted to 1.18 and 0.78 SD units, respectively. The standard deviations around these estimates indicated that there was a large degree of heterogeneity in how people reacted to the implementation of the COVID-19 lockdown (see  $\sigma_{u1}$  parameters).

Table 3 shows associations of each predictor variable with the three outcome variables. The results reported in this table include fixed effects associated with main ( $\gamma_{01}$ ) and moderation ( $\gamma_{11}$ ) effects of each variable (see Equations 4 and 5 in the data analysis section). With regard to main effects, both structural and functional characteristics of social relationships were related to lower levels of loneliness, including the size of a participant's social network, number of social interactions prior to the pandemic, interaction frequency during the pandemic, not living alone, and availability of support. A higher interaction frequency before the pandemic was associated with higher levels of positive affect. In addition, satisfaction with communication (both before and after the pandemic) was related to all outcome variables, including positive affect, negative affect, and loneliness. With regard to moderation effects, only satisfaction with communication during the COVID-19 pandemic moderated participants' reaction: Those who were more satisfied with their communication

during the COVID-19 pandemic showed less decline in positive affect and less increase in negative affect and loneliness, respectively. Across the control variables, only health was consistently related to all outcome variables. Having more health conditions was related to lower positive affect, higher negative affect, and higher loneliness, but unrelated to the response to the COVID-19 lockdown. Higher age was associated with more loneliness.

Table 4 shows the results of an analysis including all structural and functional characteristics along with health and age in a single model. In these analyses, satisfaction with communication during the pandemic was related to higher levels of positive affect ( $\gamma_{06} = 0.24$ ,  $SE = 0.08$ ) and lower levels loneliness ( $\gamma_{06} = -0.19$ ,  $SE = 0.06$ ). Satisfaction with communication continued to moderate changes in well-being and loneliness during the pandemic, with people who reported higher levels of satisfaction during the pandemic showing less decline in positive affect ( $\gamma_{16} = 0.24$ ,  $SE = 0.08$ ) and less increase in negative affect ( $\gamma_{16} = -0.39$ ,  $SE = 0.11$ ) and loneliness ( $\gamma_{16} = -0.47$ ,  $SE = 0.09$ ). In order to avoid multicollinearity, satisfaction with communication before and during the pandemic were not included in the same model. In a follow-up analysis including satisfaction with communication before instead of during the pandemic, the same main effects were found for all three outcomes. However, satisfaction with communication before the pandemic did not have any buffering effects. In addition, having more health conditions was related to lower levels of positive affect ( $\gamma_{08} = -2.04$ ,  $SE = 0.65$ ), higher levels of negative affect ( $\gamma_{08} = 2.90$ ,  $SE = 0.73$ ), and higher levels of loneliness ( $\gamma_{08} = 2.30$ ,  $SE = 0.58$ ). Higher age ( $\gamma_{07} = 0.47$ ,  $SE = 0.22$ ) was associated with higher levels of loneliness, and higher interaction frequency during the pandemic ( $\gamma_{04} = -4.29$ ,  $SE = 2.03$ ) was associated with lower levels of loneliness.

## Follow-Up Analyses

We conducted six sets of follow-up analyses. The first set of follow-up analyses examined the role of additional covariates. Too few participants were born outside of Switzerland to include this variable in the model. Marital/partner status, and income did not affect the results (see Supplemental Materials C1). A second set of follow-up analyses addressed between-person and within-person effects of the satisfaction with communication variables (Bolger & Laurenceau, 2013). Both the between-person component and the within-person component were related to higher levels of positive affect, lower levels of negative affect, and lower levels of loneliness. Neither component showed significant interactions with time, indicating that effects were similar across time periods. The time-varying within-person effect is consistent with our initial observation that satisfaction with communication during the pandemic is more closely related to changes in well-being in this time phase. Results are reported in Supplemental Material, section C2. A third follow-up analysis examined the role of the response scale of the satisfaction with communication variable. The variable collected during the pandemic was converted to a 5-point scale. The final model was estimated again using the re-coded variable. The pattern of results was identical with those reported in Table 4 (see Supplemental Material, section C3). In a fourth set of follow-up analyses, the final model was estimated without the interaction terms to further inform the interpretation of the results. The findings were largely in line with main effects reported in Table 4 (see Supplemental Material, section C4). A fifth set of analyses examined the effects of time during the pandemic. The findings indicated that the decline in positive affect and the increase in negative affect and loneliness was strongest during the first week of the time period coinciding with the pandemic and participants started recovering from these changes during the four weeks (see Supplemental Material, section C5). A sixth set of follow-up analyses examined the final model reported in Table 4 including this linear metric of time.

The pattern of findings was identical with those reported in Table 4 (see Supplemental Material, section C6).

### **Discussion and Implications**

This study aimed to examine the effect of the COVID-19 lockdown on older adults' well-being and loneliness and the role of structural and functional features of social relationships. We used data obtained during a 2019 micro-longitudinal study on older adults' social communication and compared participants' self-reported well-being and loneliness to those indicated in an online questionnaire during the first 4 weeks of the lockdown in Switzerland. We found that positive affect decreased during the lockdown, compared with 2019, while negative affect and loneliness increased. This is in line with our hypothesis that the COVID-19 pandemic and associated nationwide social distancing measures presented a substantial stressor which greatly affected older adults' well-being.

Our results show that overall, participants reported lower levels of loneliness if they had a larger social network, reported a higher number of social interactions before and during the pandemic, did not live alone and reported that social support was available to them. In addition, participants reported higher levels of positive affect if they reported a higher number of social interactions before the pandemic. None of these variables moderated the reaction to the COVID-19 pandemic. This pattern of findings suggests that intact social relationships, both at the structural and functional levels, had a positive effect on subjective well-being both in general as well as in a stressful situation.

Our results also show that there was large inter-individual variability in participants' response to the COVID-19 lockdown. The only variable consistently related to participants' response was satisfaction with communication during the COVID-19 pandemic, which was associated with less decline in positive affect and less increase in negative affect and

loneliness. This is in line with research showing that various functional aspects of social relationships may have stress-buffering effects (Lippold et al., 2016; Rook, 1987). It suggests that subjective functional aspects of social relationships and their evaluation is potentially more important to preserve positive affect, particularly during times of high stress such as the COVID-19 pandemic, than structural aspects. Studies examining the effects of the COVID-19 lockdown in different countries have reported similar results showing that subjective factors such as attitudes and worries moderated negative effects of the lockdown (Armitage & Nellums, 2020; González-Sanguino et al., 2020; Kivi et al., 2020). These and our findings indicate that subjective perceptions can influence individuals' well-being and encouraging people to maintain their social interactions might be an effective way to help maintain their well-being through high-stress situations. This is in line with the buffering hypothesis (Cohen & Wills, 1985) which posits that aspects of social relationships can buffer the negative effects of stress. The within-person aspect of the relationship between subjective satisfaction with communication and affect and loneliness also speaks to that point, i.e., participants reported higher positive affect and lower negative affect and loneliness when they were more satisfied with their interactions than usual. This further highlights the integral role that social relationships might play in older adults' mental health in everyday life and during highly stressful events. These results might be utilized in community or clinical settings, encouraging individuals to maintain their social relationships in accordance with their own subjective social preference during stressful and challenging times.

In contrast to earlier research (Hartley & Coffee, 2019; Luszczynska & Cieslak, 2005; Wethington & Kessler, 1986), our study did not find that overall perceived available support measured in the 2019 data collection buffered the effects of stress. This may be due to the uniqueness of the COVID-19 stressor, which may make it difficult for individuals to access available support due to social distancing measures. Our study did not explicitly assess



perceived available support during the COVID-19 pandemic. Among variables examined, only satisfaction with communication showed stress-buffering effects. High levels of satisfaction with communication might also reflect individuals' feelings of comfort within their social circle. This might help older adults to reduce worry related to stressful events such as the COVID-19 pandemic, similar to the way perceived social support can have a buffering effect, independently of support that is actually received (Hartley & Coffee, 2019).

We also found that participants' positive and negative affect, as well as loneliness started recovering throughout the four weeks of data collection coinciding with the COVID-19 lockdown. This is consistent with set-point theories of well-being (Diener et al., 2009), which posit that individuals possess a general baseline level of well-being which their affect returns to after experiencing negative events. That means, while the beginning of the time period coinciding with the COVID-19 lockdown might have been associated with fears related to infection, social isolation, or food shortages and a subsequent decline in well-being, as the lockdown continued, individuals might have found ways to cope and started returning towards their set-point of well-being. This might have led to the beginning recovery of scores on positive and negative affect, and loneliness shown in this study.

Although our outcome variables are highly correlated with one another, and show similar associations with other variables, our findings suggest that considering these outcomes separately provides unique information: For example, changes associated with the time period coinciding with the COVID-19 pandemic were stronger for negative affect and loneliness than for positive affect. In addition, loneliness was more closely related to social variables than positive and negative affect.

## Limitations

In closing, we note some limitations of the present study. Participants reported on daily well-being in 2019 and weekly well-being during the COVID-19 pandemic. This design was chosen to ensure a high participation rate in the online survey during the pandemic and to keep participant burden low. Also, because the 2019 study focused on digital communication, it only included older adults who used digital devices (e.g., smartphone, computers) to communicate with others. Adverse effects of social distancing on well-being may be even stronger among older adults with lower levels of technology proficiency, as they may have more difficulty remaining socially connected. A comparison between the participants of the 2019 study who did and did not also provide data in 2020 revealed that participants who did not take part in 2020 reported fewer social interactions. It is therefore possible that our results would not generalize to less socially active older adults. In addition, a simplified time metric was used: Time was specified as 0 during 2019 because we used these data as the personal pre-pandemic baseline for all individuals. We acknowledge that period effects may exist within the 2019 data collection (April-November) and that there may have been other events during that time that may have affected participants' well-being and loneliness. However, we are not aware of any event that would have effects on positive affect, negative affect, and loneliness that are comparable to the pandemic.

One specific limitation is related to the memory-experience gap: Earlier research has found that people show higher levels of both positive and negative affect when reporting their affective experiences over longer time frames (memory-experience gap, (Miron-Shatz et al., 2009). However, several points are to note that make it unlikely that our findings are based purely on methodological artefacts: First, the memory-experience-gap would indicate that participants would report higher levels of positive affect in weekly vs. daily assessments. However, our findings show the opposite pattern. Second, recent research has shown that the

memory-experience gap is weaker among older adults. For example, Neubauer and colleagues (2020) reported that the memory-experience gap in negative affect was not significant for older adults (>65 years old). In older adults, there was a minor memory-experience gap for positive affect, which, however, was in the opposite direction of our findings. Third, our effect sizes are too large to simply be caused by methodological artefacts. For example, in the study by Neubauer and colleagues (2020), the effect size for the memory-experience gap for negative affect amounted to Cohen's  $d = 0.20$  for the whole sample (weaker in older adults). While we acknowledge that our estimates may be biased, it is unlikely that this possible bias fully explains the results.

Finally, COVID-19 lockdown measures in Switzerland were comparably mild to neighboring countries. For example, people were strongly advised to stay at home in Switzerland, while they were prohibited from leaving their place of residence by more than 1 km in France. It is an open question how these variations in precautionary measures affected people's coping mechanisms.

## **Conclusion**

The COVID-19 lockdown can be considered a major stressor for older adults in our sample, as it was associated with decline in positive affect, increase in negative affect, and increase in loneliness compared with the previous year. In addition, our results indicate that satisfaction with communication was an important resource for well-being during the stressful time-period coinciding with the COVID-19 lockdown in Switzerland, by showing that the impact of the pandemic on well-being was lower for participants who were able to maintain their social interactions at a subjectively satisfactory level during the pandemic.

## References

- Amati, V., Meggiolaro, S., Rivellini, G., & Zaccarin, S. (2018). Social relations and life satisfaction: The role of friends. *Genus*, 74(1). <https://doi.org/10.1186/s41118-018-0032-z>
- Antonucci, T. C. (1986). Hierarchical mapping technique. *Generations: Journal of the American Society on Aging*, 10(4), 10–12.
- Antonucci, T. C., Ajrouch, K. J., & Birditt, K. S. (2014). The Convoy Model: Explaining social relations from a multidisciplinary perspective. *The Gerontologist*, 54(1), 82–92. <https://doi.org/10.1093/geront/gnt118>
- Appau, S., Churchill, S. A., & Farrell, L. (2019). Social integration and subjective wellbeing. *Applied Economics*, 51(16), 1748–1761. <https://doi.org/10.1080/00036846.2018.1528340>
- Armitage, R., & Nellums, L. B. (2020). COVID-19 and the consequences of isolating the elderly. *The Lancet Public Health*, 5(5), e256. [https://doi.org/10.1016/S2468-2667\(20\)30061-X](https://doi.org/10.1016/S2468-2667(20)30061-X)
- August, K. J., & Rook, K. S. (2013). Social Relationships. In M. D. Gellman & J. R. Turner (Eds.), *Encyclopedia of Behavioral Medicine* (pp. 1838–1842). Springer. [https://doi.org/10.1007/978-1-4419-1005-9\\_59](https://doi.org/10.1007/978-1-4419-1005-9_59)
- Bolger, N., & Laurenceau, J.-P. (2013). *Intensive longitudinal methods: An introduction to diary and experience sampling research*. Guilford Press.
- Bolger, N., Zuckerman, A., & Kessler, R. C. (2000). Invisible support and adjustment to stress. *Journal of Personality and Social Psychology*, 79(6), 953–961. <https://doi.org/10.1037/0022-3514.79.6.953>
- Bruine de Bruin, W., Parker, A. M., & Strough, J. (2020). Age differences in reported social networks and well-being. *Psychology and Aging*, 35(2), 159–168. <https://doi.org/10.1037/pag0000415>
- CDC. (2020, February 11). *Coronavirus Disease 2019 (COVID-19)*. Centers for Disease Control and Prevention. <https://www.cdc.gov/coronavirus/2019-ncov/need-extra-precautions/older-adults.html>
- Chan, Y. K., & Lee, R. P. L. (2006). Network Size, Social Support and Happiness in Later Life: A Comparative Study of Beijing and Hong Kong. *Journal of Happiness Studies*, 7(1), 87–112. <https://doi.org/10.1007/s10902-005-1915-1>
- Chen, Y., & Feeley, T. H. (2014). Social support, social strain, loneliness, and well-being among older adults: An analysis of the Health and Retirement Study\*. *Journal of Social and Personal Relationships*, 31(2), 141–161. <https://doi.org/10.1177/0265407513488728>
- Cohen, S., & Wills, T. A. (1985). Stress, social support, and the buffering hypothesis. *Psychological Bulletin*, 98(2), 310–357. <https://doi.org/10.1037/0033-2909.98.2.310>

Diener, E., & Iran-Nejad, A. (1986). The relationship in experience between various types of affect. *Journal of Personality and Social Psychology*, 50(5), 1031–1038.  
<https://doi.org/10.1037/0022-3514.50.5.1031>

Diener, E., Lucas, R. E., & Scollon, C. N. (2009). Beyond the Hedonic Treadmill: Revising the Adaptation Theory of Well-Being. In E. Diener (Ed.), *The Science of Well-Being: The Collected Works of Ed Diener* (pp. 103–118). Springer Netherlands.  
[https://doi.org/10.1007/978-90-481-2350-6\\_5](https://doi.org/10.1007/978-90-481-2350-6_5)

González-Sanguino, C., Ausín, B., Castellanos, M. Á., Saiz, J., López-Gómez, A., Ugidos, C., & Muñoz, M. (2020). Mental health consequences during the initial stage of the 2020 Coronavirus pandemic (COVID-19) in Spain. *Brain, Behavior, and Immunity*, 87, 172–176.  
<https://doi.org/10.1016/j.bbi.2020.05.040>

Hartley, C., & Coffee, P. (2019). Perceived and Received Dimensional Support: Main and Stress-Buffering Effects on Dimensions of Burnout. *Frontiers in Psychology*, 10.  
<https://doi.org/10.3389/fpsyg.2019.01724>

Hülür, G., & Macdonald, B. (2020). Rethinking social relationships in old age: Digitalization and the social lives of older adults. *The American Psychologist*, 75(4), 554–566.  
<https://doi.org/10.1037/amp0000604>

Jawaid, A. (2020). Protecting older adults during social distancing. *Science*, 368(6487), 145–145. <https://doi.org/10.1126/science.abb7885>

Jordan, R. E., Adab, P., & Cheng, K. K. (2020). COVID-19: Risk factors for severe disease and death. *BMJ*, 368. <https://doi.org/10.1136/bmj.m1198>

Kivi, M., Hansson, I., & Bjälkebring, P. (2020). Up and about: Older adults' wellbeing during the COVID-19 pandemic in a Swedish longitudinal study. *The Journals of Gerontology: Series B*. <https://doi.org/10.1093/geronb/gbaa084>

Lippold, M. A., Davis, K. D., McHale, S. M., Buxton, O. M., & Almeida, D. M. (2016). Daily stressor reactivity during adolescence: The buffering role of parental warmth. *Health Psychology: Official Journal of the Division of Health Psychology, American Psychological Association*, 35(9), 1027–1035. <https://doi.org/10.1037/hea0000352>

Little, R. J. A., & Rubin, D. B. (1987). *Statistical analysis with missing data*. Wiley.

Losada-Baltar, A., Jiménez-Gonzalo, L., Gallego-Alberto, L., Pedroso-Chaparro, M. del S., Fernandes-Pires, J., & Márquez-González, M. (2020). “We are staying at home.” Association of self-perceptions of aging, personal and family resources, and loneliness with psychological distress during the lock-down period of COVID-19. *The Journals of Gerontology, Series B: Psychological Sciences and Social Sciences*. <https://doi.org/10.1093/geronb/gbaa048>

Luchetti, M., Lee, J. H., Aschwanden, D., Sesker, A., Strickhouser, J. E., Terracciano, A., & Sutin, A. R. (2020). The trajectory of loneliness in response to COVID-19. *The American Psychologist*. <https://doi.org/10.1037/amp0000690>

- Luszczynska, A., & Cieslak, R. (2005). Protective, promotive, and buffering effects of perceived social support in managerial stress: The moderating role of personality. *Anxiety, Stress, & Coping, 18*(3), 227–244. <https://doi.org/10.1080/10615800500125587>
- Macdonald, B., & Hülür, G. (2020). Digitalisation and the Social Lives of Older Adults—A Microlongitudinal Study Design. *JMIR Research Protocols - Preprint*.
- Miron-Shatz, T., Stone, A., & Kahneman, D. (2009). Memories of yesterday's emotions: Does the valence of experience affect the memory-experience gap? *Emotion, 9*(6), 885–891. <https://doi.org/10.1037/a0017823>
- Neubauer, A. B., Scott, S. B., Sliwinski, M. J., & Smyth, J. M. (2020). How was your day? Convergence of aggregated momentary and retrospective end-of-day affect ratings across the adult life span. *Journal of Personality and Social Psychology, 119*(1), 185–203. <https://doi.org/10.1037/pspp0000248>
- Pinheiro, J., Bates, D., DebRoy, S., Sarkar, D., EISPACk authors, Heisterkamp, S., Van Willigen, B., & R-core. (2020). *nlme: Linear and Nonlinear Mixed Effects Models* (3.1-148) [Computer software]. <https://CRAN.R-project.org/package=nlme>
- Rook, K. S. (1987). Social support versus companionship: Effects on life stress, loneliness, and evaluations by others. *Journal of Personality and Social Psychology, 52*(6), 1132–1147. <https://doi.org/10.1037/0022-3514.52.6.1132>
- Schulz, U., & Schwarzer, R. (2003). Soziale Unterstützung bei der Krankheitsbewältigung: Die Berliner Social Support Skalen (BSSS). *Diagnostica, 49*(2), 73–82. <https://doi.org/10.1026//0012-1924.49.2.73>
- Siedlecki, K. L., Salthouse, T. A., Oishi, S., & Jeswani, S. (2014). The relationship between social support and subjective well-being across age. *Social Indicators Research, 117*(2), 561–576. <https://doi.org/10.1007/s11205-013-0361-4>
- Valtorta, N. K., Kanaan, M., Gilbody, S., & Hanratty, B. (2016). Loneliness, social isolation and social relationships: What are we measuring? A novel framework for classifying and comparing tools. *BMJ Open, 6*(4). <https://doi.org/10.1136/bmjopen-2015-010799>
- Victor, C., Scambler, S., Bond, J., & Bowling, A. (2000). Being alone in later life: Loneliness, social isolation and living alone. *Reviews in Clinical Gerontology, 10*(4), 407–417. <https://doi.org/10.1017/S0959259800104101>
- Watson, D., Clark, L. A., & Tellegen, A. (1988). Development and validation of brief measures of positive and negative affect: The PANAS scales. *Journal of Personality and Social Psychology, 54*(6), 1063–1070.
- Wethington, E., & Kessler, R. C. (1986). Perceived support, received support, and adjustment to stressful life events. *Journal of Health and Social Behavior, 27*(1), 78–89. <https://doi.org/10.2307/2136504>

WHO. (2020). *Coronavirus 2019 (COVID-19) Situation Report—51*.

Zacher, H., & Rudolph, C. W. (2020). Individual differences and changes in subjective wellbeing during the early stages of the COVID-19 pandemic. *The American Psychologist*. <https://doi.org/10.1037/amp0000702>

Zevon, M. A., & Tellegen, A. (1982). The structure of mood change: An idiographic/nomothetic analysis. *Journal of Personality and Social Psychology*, 43(1), 111–122. <https://doi.org/10.1037/0022-3514.43.1.111>

Accepted Manuscript



Table 1. Descriptive Characteristics and Intercorrelations of Study Variables

Variables	<i>M</i>	<i>SD</i>	<i>Range</i>	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1. Positive affect BP	69.62	12.31	37 – 99	–														
2. Positive affect DP	64.20	14.48	29 – 100	<b>0.49</b>	–													
3. Negative affect BP	17.08	12.97	0 – 46	<b>–0.53</b>	<b>–0.36</b>	–												
4. Negative affect DP	32.17	20.21	0 – 83	<b>–0.24</b>	<b>–0.70</b>	<b>0.47</b>	–											
5. Loneliness BP	19.78	12.32	1 – 54	<b>–0.68</b>	<b>–0.40</b>	<b>0.72</b>	<b>0.34</b>	–										
6. Loneliness DP	29.24	18.19	0 – 78	<b>–0.26</b>	<b>–0.68</b>	<b>0.33</b>	<b>0.71</b>	<b>0.48</b>	–									
7. Living alone (N/%)	39	39.4	0 – 1	–0.12	–0.07	0.01	–0.07	<b>0.21</b>	0.11	–								
8. Social network size	24.69	13.66	0 – 87	0.05	0.04	–0.14	–0.10	<b>–0.23</b>	–0.15	–0.08	–							
9. Interaction frequency BP	100.44	70.93	9 – 517	0.16	0.09	–0.09	–0.10	<b>–0.21</b>	–0.18	–0.09	<b>0.41</b>	–						
10. Interaction frequency DP	3.60	0.54	2 – 4	0.19	0.06	–0.14	–0.05	<b>–0.34</b>	–0.16	<b>–0.24</b>	<b>0.23</b>	<b>0.23</b>	–					
11. Available support	12.89	1.90	7 – 16	0.12	0.07	–0.08	0.01	<b>0.27</b>	–0.09	–0.08	0.10	0.09	<b>0.29</b>	–				
12. Satisfaction comm. BP	4.03	0.57	3 – 5	<b>0.38</b>	<b>0.25</b>	<b>–0.42</b>	<b>–0.35</b>	<b>–0.52</b>	<b>–0.32</b>	–0.01	<b>0.34</b>	<b>0.29</b>	0.15	0.05	–			
13. Satisfaction comm. DP	74.69	17.18	27 – 100	<b>0.38</b>	<b>0.51</b>	<b>–0.20</b>	<b>–0.38</b>	<b>–0.36</b>	<b>–0.58</b>	–0.05	<b>0.22</b>	0.16	0.16	0.16	<b>0.42</b>	–		
14. Age	71.49	4.90	65 – 94	–0.17	–0.01	0.04	–0.09	<b>0.35</b>	0.14	–0.17	<b>–0.24</b>	–0.18	–0.03	–0.14	–0.19	–0.13	–	
15. Gender (Men N/%)	62	62.62	1 – 2	–0.03	–0.02	0.04	–0.04	0.01	–0.05	<b>–0.40</b>	–0.13	–0.04	–0.00	–0.00	–0.08	<b>–0.32</b>	0.10	–
16. Number of health conditions	4.12	1.83	1 – 10	<b>–0.34</b>	–0.12	<b>0.38</b>	0.16	<b>0.43</b>	0.18	<b>–0.21</b>	–0.17	–0.05	–0.09	0.08	<b>–0.25</b>	–0.09	<b>0.28</b>	<b>–0.28</b>

Notes: *n* = 99; 1858 observations before the pandemic and 371 observations during the pandemic. Correlation coefficients represent Pearson's *r*. Bolded values indicate *p* < .05. Abbreviations: *M* = mean. *SD* = standard deviation. BP = before pandemic. DP = during pandemic.



Table 2. Results from unconditional models examining change in positive affect, negative affect, and loneliness

	Positive Affect		Negative Affect		Loneliness	
	$\gamma$	SE	$\gamma$	SE	$\gamma$	SE
<i>Fixed effects</i>						
Intercept ( $\gamma_{00}$ )	69.66*	1.24	17.16*	1.32	19.76*	1.25
Time ( $\gamma_{10}$ )	-5.31*	1.39	14.96*	1.83	9.49*	1.66
<i>Random effects</i>						
SD(intercept), $\sigma_{u0}$	11.97		12.73		12.12	
SD(time), $\sigma_{u1}$	11.95		16.58		15.00	
Cor(intercept, time), $r_{u0\ u1}$	-0.39		-0.18		-0.22	
SD(residual), $\sigma_e$	11.90		12.92		11.69	
AIC	17,808.65		18,218.51		17,782.12	
BIC	17,842.90		18,252.76		17,816.37	

Notes:  $n = 99$ ; 1858 observations before the pandemic and 371 observations during the pandemic. Time: 0 for observations taken before the COVID-19 pandemic and 1 for observations taken during the COVID-19 pandemic. SE = standard error. SD = standard deviation. COR = correlation. AIC = Akaike Information Criterion. BIC = Bayesian Information Criterion.

\* $p < .05$

Table 3. Results from models examining the role of each predictor variable separately.

Model no.	Fixed effects	Positive Affect		Negative Affect		Loneliness	
		$\gamma$	SE	$\gamma$	SE	$\gamma$	SE
1.	Living alone ( $\gamma_{01}$ )	-3.15	2.53	0.35	2.71	5.38*	2.52
	Living alone x Time ( $\gamma_{11}$ )	0.95	2.85	-3.34	3.75	-1.44	3.40
2.	Social network size ( $\gamma_{01}$ )	0.06	0.09	-0.14	0.10	-0.21*	0.09
	Social network size x Time ( $\gamma_{11}$ )	-0.01	0.10	-0.01	0.13	0.01	0.12
3.	Interaction frequency (before pandemic) ( $\gamma_{01}$ )	0.03	0.02	-0.02	0.02	-0.04*	0.02
	Interaction frequency (before pandemic) x Time ( $\gamma_{11}$ )	-0.01	0.02	-0.01	0.03	-0.01	0.02
4.	Interaction frequency (during pandemic) ( $\gamma_{01}$ )	4.63*	2.26	-3.44	2.43	-7.79*	2.20
	Interaction frequency (during pandemic) x Time ( $\gamma_{11}$ )	-2.86	2.57	1.50	3.41	2.67	3.08
5.	Perceived available support ( $\gamma_{01}$ )	0.76	0.65	-0.56	0.69	-1.84*	0.63
	Perceived available support x Time ( $\gamma_{11}$ )	-0.18	0.73	0.62	0.97	0.92	0.87
6.	Satisfaction with communication (before pandemic) ( $\gamma_{01}$ )	8.17*	2.01	-9.58*	2.11	-11.19*	1.89
	Satisfaction with communication (before pandemic) x Time ( $\gamma_{11}$ )	-1.76	2.45	-2.75	3.23	0.95	2.93
7.	Satisfaction with communication (during pandemic) ( $\gamma_{01}$ )	0.27*	0.07	-0.18*	0.08	-0.27*	0.07
	Satisfaction with communication (during pandemic) x Time ( $\gamma_{11}$ )	0.19*	0.08	-0.34*	0.10	-0.39*	0.09
8.	Age ( $\gamma_{01}$ )	-0.40	0.25	0.09	0.27	0.89*	0.24
	Age x Time ( $\gamma_{11}$ )	0.38	0.28	-0.49	0.37	-0.40	0.34
9.	Gender ( $\gamma_{01}$ )	-0.76	2.57	1.12	2.73	0.31	2.60
	Gender x Time ( $\gamma_{11}$ )	0.48	2.88	-2.96	3.79	-2.21	3.43
10.	Health conditions ( $\gamma_{01}$ )	-2.29*	0.64	2.75*	0.67	2.91*	0.63
	Health conditions x Time ( $\gamma_{11}$ )	1.29	0.76	-0.99	1.01	-1.03	0.91

Notes:  $n = 99$ ; 1858 observations before the pandemic and 371 observations after the pandemic. Time: 0 for observations taken before the COVID-19 pandemic and 1 for observations taken during the COVID-19 pandemic. SE = standard error. SE = standard error. SD = standard deviation. COR = correlation. All models include an intercept and the main effect of time (fixed and random effects), which are omitted from this table for brevity.

\*  $p < .05$

Table 4. Results from full models including all predictor variables, age, and health.

	Positive Affect		Negative Affect		Loneliness	
	$\gamma$	SE	$\gamma$	SE	$\gamma$	SE
<i>Fixed effects</i>						
Intercept ( $\gamma_{00}$ )	69.72*	1.10	17.06*	1.22	19.67*	0.98
Time ( $\gamma_{10}$ )	-5.28*	1.34	14.92*	1.75	9.45*	1.50
Living alone ( $\gamma_{01}$ )	-1.21	2.41	-1.79	2.67	1.60	2.15
Living alone x Time ( $\gamma_{11}$ )	-2.34	2.94	-0.12	3.83	2.66	3.27
Social network Size ( $\gamma_{02}$ )	-0.14	0.09	-0.03	0.10	0.02	0.08
Social network Size x Time ( $\gamma_{12}$ )	0.03	0.11	0.03	0.15	0.05	0.13
Interaction frequency (pre-COVID) ( $\gamma_{03}$ )	0.02	0.02	-0.01	0.02	-0.01	0.02
Interaction frequency (pre-COVID) x Time ( $\gamma_{13}$ )	-0.01	0.02	-0.01	0.03	-0.01	0.02
Interaction frequency (COVID) ( $\gamma_{04}$ )	2.36	2.28	-1.40	2.53	-4.29*	2.03
Interaction frequency (COVID) x Time ( $\gamma_{14}$ )	-3.44	2.79	2.00	3.64	3.41	3.10
Perceived available support ( $\gamma_{05}$ )	0.28	0.63	-0.52	0.70	-1.10	0.56
Perceived available support x Time ( $\gamma_{15}$ )	-0.31	0.77	1.07	1.00	1.46	0.85
Satisfaction with communication (during pandemic) ( $\gamma_{06}$ )	0.24*	0.07	-0.13	0.08	-0.19*	0.06
Satisfaction with communication (during pandemic) x Time ( $\gamma_{16}$ )	0.24*	0.08	-0.39*	0.11	-0.47*	0.09
Age ( $\gamma_{07}$ )	-0.10	0.25	-0.29	0.27	0.47*	0.22
Age x Time ( $\gamma_{17}$ )	0.32	0.30	-0.46	0.39	-0.36	0.33
Health conditions ( $\gamma_{08}$ )	-2.04*	0.65	2.90*	0.73	2.30*	0.58
Health conditions x Time ( $\gamma_{18}$ )	1.36	0.81	-1.02	1.05	-1.33	0.90
<i>Random effects</i>						
SD(intercept) $\sigma_{u0}$	10.56		11.71		9.33	
SD(time) $\sigma_{u1}$	11.45		15.73		13.22	
Cor(intercept, time), $r_{u0u1}$	-0.51		-0.26		-0.37	
SD(residual) $\sigma_e$	11.90		12.92		11.69	
Pseudo $R^2$	14.51		29.03		24.51	
AIC	17,795.32		18,209.45		17,729.70	
BIC	17,920.74		18,334.88		17,855.13	

Notes:  $n = 99$ ; 1858 observations before the pandemic and 371 observations after the pandemic. Time: 0 for observations taken before the COVID-19 pandemic and 1 for observations taken during the COVID-19 pandemic. SE = standard error. SD = standard deviation. COR = correlation. AIC = Akaike Information Criterion. BIC = Bayesian Information Criterion.

\*  $p < .05$